inclined away from a longitudinal centerline of the can at a first external rising wall angle of inclination and a second inclined portion extending from the first inclined portion to the can body and inclined away from the longitudinal centerline of the can at a second external rising wall angle of inclination greater than the first external rising wall angle of inclination, the annular ground portion integrally connected to the can body at the second inclined portion of the external rising wall and disposed radially inwardly relative to the longitudinal centerline of the can body diameter with an annular ground portion diameter being in a range of 70% to 98% of the can body diameter, the annular ground portion projecting outwardly of the can interior at a height in a range of 0.1 to 10.0 mm relative to the bottom wall, the annular bead integrally connected radially inwardly of the annular ground portion by the internal rising wall with the annular bead projecting into the can interior at a depth in a range of 0.1 to 5.0 mm relative to the bottom wall, the bottom wall having a flat shape and a bottom wall diameter in a range of 60% to 90% of the annular ground portion diameter, the first external rising wall angle of inclination being in a range of 5° to 30°, the internal rising wall rising at an internal rising wall angle of inclination in a range of 65° to 90° relative to a support surface of the can.

REMARKS

Claims 1, 2, 6, 10-14 and 16 are pending in the application. By this Amendment, claims 5, 7-9 and 15 are canceled without prejudice or disclaimer and claims 1, 10, 13 and 16 are amended.

Claims 1, 2, 5-10 and 12-16 are rejected under 35 U.S.C. §112, second paragraph. The claims are amended to obviate the rejection. Withdrawal of the rejection is respectfully requested.

Claims 12, 13 and 16 are rejected under 35 U.S.C. 112, second paragraph. The claims are amended to obviate the rejection. Withdrawal of the rejection is respectfully requested.

Claims 1, 6-10 and 12-15 are rejected under 35 U.S.C. §103(a) as being unpatentable over Leftault, Jr. et al. (U.S. Patent No. 4,967,538) in view of Lyu (U.S. Patent No. 3,905,507) and MacPherson (U.S. Patent No. 4,402,419). The rejection is

respectfully traversed.

With respect to Leftault, the original shape of a can is that the bottom of a can is in an externally convex state, as shown in Figure 1, in which the internal volume is made large to thereby enable hot fill, and when contents are cooled so that the inside becomes negative pressure, the can bottom is pressed internally to reduce the internal volume to thereby raise pressure within the can. This is different in original shape of a can from that of the present invention.

Accordingly, Leftault requires the step of reforming a can food after the can food has been cooled. On the other hand, in a can food and a can according to the present invention, it is possible to obtain canned food capable of achieving not only hot pack filling but retort sterilization by a can in which wall thickness is thin without requiring such a step as described at all. Moreover, since the canned food obtained by the present invention has "tapping inspection aptitude," a fine change in internal pressure can be measured. Leftault describes nothing about the tapping inspection aptitude, and fails to describe the wall thickness.

It is generally carried out that contents are filled in a can whose wall thickness is thin and liquid nitrogen is filled to make the inside of the can positive pressure to give strength to the can. However, the liquid nitrogen has an extremely low boiling point of approximately 196 degrees C., it becomes boiled immediately, and the filling quantity tends to become uneven, because evenness of internal pressure of canned food is great. Therefore, when an attempt is made such that perishable contents such as milk drinks are filled in a can whose wall thickness is thin, and liquid nitrogen is filled to thereby make the inside of the can positive pressure to give strength to the can, discrimination cannot be made whether internal pressure of a can rises due to the putrification of contents or whether internal pressure of a can rises due to the unevenness of the filling quantity of liquid nitrogen. Therefore, there has been heretofore proposed that weak acid drinks such as milk drinks are filled in a can whose wall thickness is thin (for example, Yamamoto), which is however not yet put to practical use, and such contents as described have been filled in a can whose wall thickness is thick.

The present inventors have invented, in addition to the present invention, a method for filling liquid nitrogen without unevenness (see U.S. Patent No. 6,519,919) to enable filling liquid nitrogen maintaining internal pressure of a can in a range of 0.2 to 0.8 kgf/cm^2 with accuracy of +/-0.2 kgf/cm^2, and the present invention provides a can having the characteristics capable of accurately measuring internal pressure, without causing the can bottom to produce buckling due to the rise of internal pressure of the can at the time of retort sterilization by a can of thin wall thickness, without deformation of the can after cooling, and with the measuring accuracy not less than +/-0.2 kgf/cm^2 by tapping inspection to thereby enable filling parishable contents in a can whose wall thickness is thin. The range capable of accurately measuring internal pressure in such a range of error described is merely a case where internal pressure of a can is within the range of 0.2 to 0.8 kgf/cm^2 as shown in the graph of Figure 5. Accordingly, where, for example, milk drinks are filled so as to assume internal pressure not less than 1 kgf/cm^2 with liquid nitrogen, and error in measurement of internal pressure after sealing increases, and therefore, where internal pressure of a can slightly becomes high due to putrification of milk, it cannot be detected accurately, which is therefore not practical.

With regard to Lyu, it is respectfully submitted that there are differences between the present invention and Lyu, to wit:

(1) DEFINITE DIMENSIONS

In Lyu, the range of dimensions is prescribed as follows:

D2=0.85 to 0.95D1 R1=3.0 to 5.0T1

H1=8.0 to 15T1 H2=15 to 25T1

On the other hand, in the present invention, values of dimensions indicated in the Embodiment 1 are as follows:

T1=0.18 mm H1=3.3 mm H2=5.2 mm

H1=8.0 to 15T1 D2=46.8 mm

Therefore, the values result in:

H1=18.3T1 H2=28.9T1

Which are clearly the outside the range of Lyu.

(2) SHAPE

The bottom shape according to the present invention is that in order to improve the pressure resistance performance, an angle of inclination α of the rising wall from the ground portion to the outer side is narrowed, and further the ground portion is made closer to the inside-diameter side to thereby reduce the pressure that is received by the bottom on the inside-diameter side from the ground portion. Accordingly, it is essential that a step change (inflection point) is formed in the rising wall connected the annular ground portion to a lower end of a body wall. In short, an outside of the annular ground portion constitutes an external rising wall including a first inclined portion inclined rising outwardly of the can and a second inclined portion inclined externally to be larger than the first inclined portion. However, Lyu merely discloses that the side wall 12 and the bead 16 are connected by the arcuate portion 24 slightly inclined internally (see column 3, lines 23 to 26).

On the other hand, from a viewpoint of tap test aptitudes, it is necessary to make the diameter of the flat portion in the central portion of the can bottom as large as possible in order to lower the natural frequency of circular plate. Thus, the second difference between the present invention and Lyu is the provision of the construction in which the R3 portion as prescribed in Lyu is not provided but an angle of inclination of the internal rising wall is suitably used to thereby enable forming a wide disk in the central portion of the can bottom.

As described above, the can body of the present invention has a shape for improving the pressure resistance by a thinner plate, and a shape having a tap test aptitude in addition to the improvement of the pressure resistance performance. The can body of the present invention

as described above is not readily thought out from Lyu, and this is novel and nonobvious over Lyu.

MacPherson describes the wall thickness of a can bottom of a steel can is 0.006-0.009 inches and a can bottom of an aluminum can is 0.010-0.014 inches. However, in case of such a thickness as described, in a conventional can bottom shape, the strength of the can cannot be maintained unless the internal pressure of the can is high. In fact, MacPherson describes that the internal pressure of a can is 90 psi (equivalent to 6.37 kgf/cm^2) in column 3, lines 21-23. The fact that with such a thin wall thickness, the strength can be maintained with the internal pressure of the can in a range of 0.2 to 0.8 kgf/cm^2, even the retort sterilization is performed, the can is deformed, and the internal pressure of the can can be measured accurately becomes first enabled by combining the various conditions of the can bottom shape of the present invention. Accordingly, the present invention cannot be considered obvious from the cited references.

Yamamoto describes a method for manufacturing can food comprising: filling and sealing low acid drinks into an aluminum can having internal pressure of 0.6-1.8 kgf/cm^2, after which supplying vapor and air with external pressure of the can of 0.8-1.5 kgf/cm^2 in retort, and pressing and sterilizing to prevent the can bottom from being deformed. However, Yamamoto describes nothing about the shape of a can bottom and the tapping inspection aptitude. Therefore, it is generally known to have a bottom shape of a dome similar to, for example, beer cans and carbonic acid-drink cans in order to withstand the internal pressure as described. If the can bottom is made to be a dome shape, there is no tapping inspection aptitude. Therefore, in such can food as described, the change in internal pressure caused by putrification of contents cannot be detected accurately. Accordingly, it is natural that Yamamoto fails to describe anything regarding tapping inspection aptitude.

The cited references partly describe a portion of the constituent requirements of a can according to the present invention. However, none of the cited references describe a can provided with all the constitutions of the can according to the present invention from a viewpoint described above. Further, none of the cited references have

the technical idea as described above, and therefore, it is not obvious that such cited references as described are combined to constitute the present invention. For example, Leftault describes it is possible to increase the internal pressure with the filled and sealed container from between 1 and 50 psig while reducing... (Column 6, lines 13-15), which clearly includes even the high internal pressure of up to 3.5 kgf/cm^2 with far exceeds 0.8 kgf/cm^2, which is outside the object of the can food of the present invention.

It is respectfully submitted that, for at least the reasons discussed above, none of the applied art, alone or in combination, teaches or suggests the features of the present invention as particularly recited in claims 1, 10 and 16. Thus, one of ordinary skill in the art would not be motivated to combine the features of the applied art because such combination would not result in the claimed invention. Therefore, it is respectfully submitted that claims 1, 10 and 16 are allowable over the applied art.

Claim 6 depends from claim 1 and include all of the features of claim 1. Claims 12 and 14 depend from claim 10 and include all of the features of claim 10. Thus, it is respectfully submitted that the dependent claims are allowable at least for the reason the independent claims are allowable as well as for the features they recite.

Claims 7-9 and 15 are canceled and therefore the rejection as applied to these claims is now moot.

Withdrawal of the rejection is respectfully requested.

Claim 2 is rejected under 35 U.S.C. §103(a) as being unpatentable over Leftault, Jr. et al. (U.S. Patent No. 4,967,538) in view of Lyu (U.S. Patent No. 3,905,507) and MacPherson (U.S. Patent No. 4,402,419) as applied to claims 1, 6-10 and 12-15, and further in view of Yamaguchi (U.S. Patent No. 4,431,112). The rejection is respectfully traversed.

Yamaguchi teaches a drawn and higher and can body with an integral bottom for packaging pressurized beverages.

It is respectfully submitted that claim 1, for the reasons discussed above, is allowable over Leftault, Lyu and MacPherson and Yamaguchi fails to cure the deficiencies therein. Thus, claim 1 is allowable over the applied art. Claim 2 depends

from claim 1 and includes all of the features of claim 1. Thus, it is respectfully submitted that claim 2 is allowable at least for the reasons claim 1 is allowable as well as for the features it recites.

Withdrawal of the rejection is respectfully requested.

Claim 5 is rejected under 35 U.S.C. §103(a) as being unpatentable over Leftault, Jr. et al. (U.S. Patent No. 4,967,538) in view of Lyu (U.S. Patent No. 3,905,507) and MacPherson (U.S. Patent No. 4,402,419) as applied to claims 1, 6-10 and 12-15, and further in view of Yamamoto (JP 01252274). The rejection is respectfully traversed.

Yamamoto teaches packaging a low-acidic beverage in an aluminum can.

It is respectfully submitted that claim 1, for the reasons discussed above, is allowable over Leftault, Lyu and MacPherson and Yamamoto fails to cure the deficiencies therein. Thus, claim 1 is allowable over the applied art. Claim 5 depends from claim 1 and includes all of the features of claim 1. Thus, it is respectfully submitted that claim 5 is allowable at least for the reasons claim 1 is allowable as well as for the features it recites.

Withdrawal of the rejection is respectfully requested.

Claim 16 is rejected under 35 U.S.C. §103(a) as being unpatentable over Leftault, Jr. et al. (U.S. Patent No. 4,967,538) in view of Lyu (U.S. Patent No. 3,905,507), MacPherson (U.S. Patent No. 4,402,419) and Cerny (U.S. Patent No. 4,381,061). The Examiner asserts that all of the features of these claims are either taught or suggested in the combination of these references.

Cerney teaches a non-paneling container fabricated from a plastic or thermoplastic material. Figures 2-6 illustrate the detailed structural features of the bottom of the container.

Claim 16 is directed to a can that includes a can body with a can body diameter defining a can interior and a bottom thereof molded integrally with the can body, the bottom of the can having an annular ground portion, an annular bead and a bottom wall integrally connected to each other with the annular bead disposed between the annular ground portion and the bottom wall, the annular ground portion defining a crest portion and having an annular ground portion diameter and including an external rising wall and

an internal rising wall, the external rising wall including a first inclined portion extending from the crest portion and inclined away from a longitudinal centerline of the can at a first external rising wall angle of inclination and a second inclined portion extending from the first inclined portion to the can body and inclined away from the longitudinal centerline of the can at a second external rising wall angle of inclination greater than the first external rising wall angle of inclination, the annular ground portion integrally connected to the can body at the second inclined portion of the external rising wall and disposed radially inwardly relative to the longitudinal centerline of the can body diameter with an annular ground portion diameter being in a range of 70% to 98% of the can body diameter, the annular ground portion projecting outwardly of the can interior at a height in a range of 0.1 to 10.0 mm relative to the bottom wall, the annular bead integrally connected radially inwardly of the annular ground portion by the internal rising wall with the annular bead projecting into the can interior at a depth in a range of 0.1 to 5.0 mm relative to the bottom wall, the bottom wall having a flat shape and a bottom wall diameter in a range of 60% to 90% of the annular ground portion diameter, the first external rising wall angle of inclination being in a range of 5° to 30°, the internal rising wall rising at an internal rising wall angle of inclination in a range of 65° to 90° relative to a support surface of the can.

It is respectfully submitted that none of the applied art, alone or in combination, teaches or suggests the features recited in claims 16. Thus, it is respectfully submitted that one of ordinary skill in the art would not be motivated to combine the teachings of the applied art because such combination would not result in the present invention. Therefore, it is respectfully submitted that claim 16 allowable over the applied art.

Withdrawal of the rejection is respectfully requested.

In view of the foregoing, reconsideration of the application and allowance of the pending claims are respectfully requested. Should the Examiner believe anything further is desirable in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' representative at the telephone number listed below.

Should additional fees be necessary in connection with the filing of this paper or

if a Petition for Extension of Time is required for timely acceptance of the same, the Commissioner is hereby authorized to charge Deposit Account No. 18-0013 for any such fees and Applicant(s) hereby petition for such extension of time.

Respectfully submitted,

Dated: April 30, 2003

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Enclosure(s): Appendix I (Marked-Up Version of Amended Claims)

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